

AMENDMENTS TO THE CLAIMS

1. (original) Apparatus comprising:

a first line interface for providing layer-1 interfacing to a communications trunk carrying a trunk signal;

a first framer coupled to said first line interface providing layer-2 interfacing to said trunk signal to make available frames of multiplexed individual subscriber signals, said individual subscriber signals each including respective transmit and receive signals; and

a test controller coupled to said first framer for continuously de-multiplexing said frames, sampling a de-multiplexed individual transmit signal from a selected individual subscriber signal, storing said samples in a queue for a selected echo delay, adding said samples to an individual receive signal for said selected individual subscriber signal after said selected echo delay, and continuously re-multiplexing said frames.

2. (original) The apparatus of claim 1 further comprising:

a second line interface for providing layer-1 interfacing to said communications trunk; and

a second framer coupled to said test controller and said second line interface providing layer-2 interfacing to said trunk signal;

wherein said first line interface, said first framer, said test controller, said second framer, and said second line interface are adapted to be connected in series with said communications trunk.

3. (original) The apparatus of claim 2 wherein said test controller is further adapted to delay said samples for a selected line delay and to provide said line-delayed samples as an individual transmit signal of said selected individual subscriber signal for re-multiplexing.

4. (original) The apparatus of claim 1 wherein said test controller further comprises a selectable gain for adjusting a gain of said samples prior to adding them to an individual receive signal.

5. (original) The apparatus of claim 4 wherein said selectable gain is adjustable with a range from about -10 to about -60 dB.

6. (original) The apparatus of claim 1 wherein separate echo delays and separate line delays are programmable for each individual subscriber signal.

7. (original) The apparatus of claim 6 wherein said delays are programmable within a range of from about 125 milliseconds to about 5 seconds.

8. (original) A method for testing echo cancellers for connecting to individual terminals, said individual terminals exchanging transmit and receive signals within a telecommunications system including a communications trunk, said method comprising the steps of:

receiving respective transmit signals in said telecommunications system from each of said individual terminals;

multiplexing a plurality of transmit signals into respective slots in a multiplexed signal;

coupling said multiplexed signal to a termination of said communications trunk;

connecting a test apparatus to said communications trunk;

de-multiplexing said plurality of transmit and receive signals within said test apparatus;

sampling at least one selected de-multiplexed transmit signal from its respective slot;

re-multiplexing said de-multiplexed transmit signals into said respective slots in a re-multiplexed transmit signal and coupling said re-multiplexed transmit signal to said communications trunk;

delaying said sampled signal by a selected echo delay to generate a delayed echo signal;

adding said delayed echo signal to a selected de-multiplexed receive signal corresponding to said selected de-multiplexed transmit signal;

re-multiplexing said de-multiplexed receive signal in said test apparatus after said addition step and coupling said re-multiplexed received signal to said communications trunk;

de-multiplexing said receive signal from said termination of said communications trunk to recover said receive signals;

passing said receive signals through respective echo cancellers to generate echo-cancelled signals; and

evaluating cancellation of said delayed echo signal by a corresponding echo canceller.

9. (original) The method of claim 8 further comprising the step of delaying said de-multiplexed transmit signal prior to re-multiplexing in response to a selected line delay.

10. (original) The method of claim 8 further comprising the step of applying a selected gain to said delayed echo signal prior to adding to said selected de-multiplexed receive signal.

11. (new) Testing apparatus for connecting to a DS-1 communication line, comprising:

a first line interface for providing layer-1 interfacing to said DS-1 communication line;

a first framer coupled to said first line interface providing layer-2 interfacing make available frames of multiplexed individual subscriber signals carried by said DS-1 communication line, said individual subscriber signals each including respective transmit and receive signals; and

a test controller coupled to said first framer for continuously de-multiplexing said frames, sampling a de-multiplexed individual transmit signal from a selected individual subscriber signal, storing said samples in a queue for a selected echo delay, adding said samples to an individual receive signal for said selected individual subscriber signal after said selected echo delay, and continuously re-multiplexing said frames;

a second line interface for providing layer-1 interfacing to said DS-1 communication line; and

a second framer coupled to said test controller and said second line interface providing layer-2 interfacing for said frames;

wherein said first line interface, said first framer, said test controller, said second framer, and said second line interface are adapted to be connected in series with said DS-1 communication line.

12. (new) The testing apparatus of claim 11 wherein said test controller is further adapted to delay said samples for a selected line delay and to provide said line-delayed samples as an individual transmit signal of said selected individual subscriber signal for re-multiplexing.

13. (new) The testing apparatus of claim 11 wherein said test controller further comprises a selectable gain for adjusting a gain of said samples prior to adding them to an individual receive signal.

14. (new) The testing apparatus of claim 13 wherein said selectable gain is adjustable with a range from about -10 to about -60 dB.

15. (new) The testing apparatus of claim 11 wherein separate echo delays and separate line delays are programmable for each individual subscriber signal.

16. (new) The testing apparatus of claim 15 wherein said delays are programmable within a range of from about 125 milliseconds to about 5 seconds.